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ABSTRACT

This paper presents the results of a study designed to determine the computer anxiety, attitudes, and confidence levels of students enrolling in preservice teacher education computing courses. Specific questions compared these students with national norms, and looked to see whether sex, age, or past computer experiences had any effect on measures of student enjoyment of using computers, their computer anxiety and confidence levels, and their perceptions of the usefulness of computers. Data were collected from 518 college students (394 female, 108 male, and 16 not reported). Results indicated that prior knowledge and experience with computers correlate highly with student attitudes toward computer use. This relationship indicates that these earlier experiences were generally successful, even though the majority of the experiences consisted of recreational computer games and simple word processing. Approximately 32% of the variance in anxiety scores, 30% of the variance in confidence scores, and 10% of the variance in usefulness scores were shared by previous word processing, recreation, programming, and database experience. Removing sex, age, and experience using spreadsheets did not significantly change the predictive value of the equation for the anxiety, confidence, or usefulness subscale scores. It is concluded that student attitudes toward working with computers are important indicators of the ways in which students will use computers when they become teachers in their own classroom settings. (9 references) (DB)

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Entry Attitudes of Students towards using Computers

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by

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Entry Attitudes of Students towards using Computers

The introduction of the personal computer into the classroom in the 1970's gave educators a powerful new instructional tool. Today at least ninety-seven percent of all American schools use computers in their instructional programs and many schools are expanding upon their computer capabilities by purchasing auxiliary or peripheral devices such as modems, compactdisc and videodisc players (McCarthy, 1988; Bruder, 1989).

Despite the heavy investment in these modern technologies, their potential will never be realized unless the classroom teacher is prepared to effectively use them. Only half of all classroom teachers report that they have used computers in their instruction and fewer still have discovered the potential of interactive technologies. Major factors in this underuse are teacher knowledge and attitudes. Many teachers are fearful of computers and lack an understanding of the computer and related technology's value in teaching the curriculum. (OTA, 1988, p. 87).

Most states are addressing this problem by either providing technology-related inservice experiences for their teachers and/or recommending that preservice teachers take coursework in educational computing while in their teacher preparation programs. Twenty-three states, including California, require that teachers demonstrate competence in educational computing before they receive their credential (Bruder, 1989).

Though requiring coursework and providing inservice opportunities are positive steps toward encouraging teachers to take advantage of the technology available to them, research has shown that significant numbers of teachers are computer-anxious and that this anxiety interferes with their ability to integrate technology in their classroom teaching (Zelman, 1986; Howard & Smith, 1986; Raub, 1981). Therefore, it is important that educational computing courses for classroom teachers be taught in a manner which reduces computer anxiety and computer confidence.

The purpose of this study was to determine the computer anxiety, attitudes and confidence levels of students enrolling in CSU educational computing courses for classroom teachers. Specific questions compared these students with national norms, and looked to see if sex, age, or past computer experiences had any effect on measures of student enjoyment of using computers, their computer anxiety and confidence levels, and their perceived usefulness of computers.

Methodology:

Plans for this study were presented at the fall 1990 meeting of the Association of State Technology Using Teacher Educators, an organization with representation from each of the institutions within the California State University. Faculty from four CSU campuses agreed to participate in this study during the 1991 spring, summer, and fall semesters.

Each participant distributed the research instrument to their students during the first week of class. The research instrument consisted of Loyd's (1989) 40-item Computer Attitude Scale, some inquiries regarding demographic data, and six questions about students' prior experiences using computers. Data were gathered from a total of 518 students; 394 female, 108 male, and 16 not reported. Their ages ranged from 20 to 60, with the mean age being 32.3, with a standard deviation of 8.3.

The Computer Attitude Scale (CAS) is a 40 item instrument on which respondents indicate the extent to which they agree or disagree with statements about computer anxiety, confidence, usefulness, and liking. The CAS generates four subscales which measure the degree to which respondents feel anxious about using computers, have confidence in their ability to use a computer, like using computers, and view computers as useful for them. Loyd & Loyd (1985) report on a study which was conducted to determine the reliability of the four CAS subscales, the factorial validity of the subscales, and their ability to differentiate among three groups of 114 kindergarten through twelfth grade teachers with different amounts of previous experience using computers.

Correlations among the subscales were computed, as were means, standard deviations, and estimates of internal consistency relability. The reliability coefficients for internal consistency were .90, .89, .89, and .82 respectively for anxiety, confidence, liking, and usefulness. A strong correlation (.92) was found between anxiety and confidence, indicating these subscales might be measuring the same trait. Correlations among the other subscales were also high, but reflected "enough unique variance to support an interpretation of a separate score" (p. 908).

Findings

As reported in Table 1, mean scores for CSU student anxiety, confidence, liking, and usefulness were 18.490 (sd 6.847), 31.701 (sd 5.780), 30.909 (sd 6.061), and 35.160 (sd 4.066). Since a neutral score on any of these subscales would be 25, these scores indicate that the students disagreed slightly with items associated with high anxiety, low confidence, low liking, and low perceptions of usefulness. Further, though the CSU population reported they thought

computers to be more useful but less likable than the teacher population on which the instrument was normed, there were no meaningful differences between the two groups.

Table 1 Comparison of Scores on the Computer Attitude Scale

Scale	CSU Students (n = 518)		Normed Population	
	Mean	Std Dev	Mean	Std Dev
Anxiety	18.490*	6.847	32.1	6.1
Confidence	31.701	5.780	31.3	5.6
Liking	30.909	6.061	33.3	5.4
Usefulness	35.160	4.066	33.9	4.1

* Please note that in order to counteract a high score meaning a low level of anxiety, the researchers reversed the directionality of this subscale. Using Loyd's scoring procedure, the mean anxiety score for CSU Students would be 31.510.

Responses to individual items which are especially significant for teacher educators were also tabulated. These items, given in Table 2 below, relate to feelings about being in a computer class and attitudes toward using computers in their future classrooms. Generally, most students felt anxious about taking a computer class, but nearly all (96%) agreed that it was important that they do well in such classes. Most students expressed a need to master the use of a computer (69%) and nearly all thought that such proficiency would help them find jobs (96%), but they did not think computers would actually be useful in their work (88%) and almost none could think of any way they might use computers in their teaching career (96%).

Table 2 Frequencies of Student Responses on Selected Statements (N=516)

Statement	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
1. (take classes)	31	88	147	250
2. (ease in class)	29	98	180	211
3. (do well in class)	365	128	16	7
4. (need to master)	147	209	125	35
5. (job prospects)	341	125	32	18
6. (not use in career)	432	64	14	4
7. (impt. in work)	319	134	31	21

Statements:

1. It wouldn't bother me at all to take computer courses.
2. I would feel at ease in a computer class.
3. It is important to me to do well in computer classes.
4. I'll need a firm mastery of computers for my future work.
5. Knowing how to work with computers will increase my job possibilities.
6. I can't think of any way that I will use computers in my career.
7. Working with computers will not be important to me in my life's work.

Students were asked to estimate how many times they had previously used a computer for word processing, programming, spreadsheet, database, and recreational applications. As shown in Table 3, students reported having many more experiences using computers for wordprocessing than for programming, spreadsheets, or database analysis. The students were most evenly divided on their reports of previous experiences using computers for recreational purposes. Please note that the instances of "No Report" reflect the fact that these questions were on the back side of a page and approximately 60 students did not see them.

Table 3 Frequencies of Students' Previous Computer Experiences (N = 518)

Application	Never	1-10	11-20	21-30	> 30 times	No Report
Wordprocessing	95	99	46	39	179	60
Programming	248	120	30	20	40	60
Spreadsheets	317	96	15	6	24	60
Databases	316	86	16	12	26	62
Recreation	100	140	64	41	108	65

A correlational analysis was conducted among all the variables. As shown in Table 4, there were high correlations found among the subscale scores and moderate correlations found related to previous experiences and scores on the anxiety and confidence subscales.

Table 4 Correlation Matrix

	Sex	Age	Anx	Conf	Liking	Useful	WP	Prog	SS	DB	Rec
Sex	1.000										
Age	.024	1.000									
Anxiety	-.077	.108	1.00								
Confidence	.066	-.095	-.878	1.00							
Liking	-.001	-.073	-.682	.740	1.000						
Useful	-.013	-.108	-.517	.593	.696	1.000					
Wordprocessing	.013	-.151	-.498	.431	.268	.255	1.000				
Programming	.171	-.159	-.360	.404	.272	.232	.419	1.000			
Spreadsheeet	.050	.000	-.322	.316	.267	.186	.397	.465	1.000		
Database	.147	-.180	-.415	.430	.296	.233	.447	.356	.556	1.000	
Recreation	.147	-.180	-.415	.430	.296	.233	.447	.342	.250	.166	1.00

Comparisons of subgroups

A decending stepwise multiple regression analysis was run on each of the four subscale scores. The variables "sex and "age" did not contribute enough variance in the subscales to be included in the regression equations. Strong differences were found, however, when grouping students by their previous computer experiences.

Analysis of Subscale Scores

It was found that removing sex, age, and experience using spreadsheets did not significantly change the predictive value of the equation for the anxiety, confidence, or usefulness subscale scores. As shown in Table 5, the correlation coefficients and beta weights of the remaining variables for the anxiety subscale score indicate there is a strong negative correlation between having extensive wordprocessing experience, a moderate negative correlation of experiences using computers for recreation, and slightly negative correlations for having experience using computer programming and databases. Approximately 32% of the variance in anxiety scores was shared by previous wordprocessing, recreation, programming, and database experience.

Table 5 **Regression Coefficients and Beta Weights for Predicting Anxiety Subscale Score**

Dependent Variable	Regression Coeff	Beta
Wordprocessing	-1.383065	-.324580
Recreation	-0.978265	-.213805
Programming	-0.609602	-.114515
Databases	-0.641424	-.103550
(Constant)	24.394644	
Multiple R = .56582		R Square = .32015
F = 45.79636		Significance of F = .0000

Table 6 gives the correlation coefficients and beta weights of the remaining variables for the confidence subscale score. Using computers for recreational purposes has the strongest correlational relationship to having confidence in one's ability to use computers. Approximately 30% of the variance in confidence scores was shared by previous wordprocessing, recreation, programming, and database experience.

Table 6 **Regression Coefficients and Beta Weights for Predicting Confidence Subscale Score**

Dependent Variable	Regression Coeff	Beta
Recreation	.984110	.254809
Wordprocessing	.748093	.207991
Programming	.886517	.197293
Databases	.478956	.091603
(Constant)	27.074923	
Multiple R = .55077		R Square = .30335
F = 42.34623		Significance of F = .0000

Table 7 shows the correlation coefficients and beta weights for variables predicting the usefulness subscale score. Again, the beta weights indicates that the best predictors of usefulness scores were previous experience with wordprocessing and recreational use of computers, though database and

spreadsheet experience were also of significance. Still, only 10% of the variance in usefulness scores was shared by previous wordprocessing, recreation, programming, and database experience.

Table 7 Regression Coefficients and Beta Weights for Predicting Usefulness Subscale Score

Dependent Variable	Regression Coeff	Beta
Wordprocessing	.325119	.145002
Recreation	.340069	.125169
Programming	.322633	.102068
Databases	.345886	.094038
(Constant)	33.285954	
Multiple R = .32142		R Square = .10331
F = 11.20449		Significance of F = .0000

Analysis of Liking Subscale Scores

As shown in Table 8, the Liking subscale scores differ from the other three in that sex, age, and experience with wordprocessing and databases did not significantly change the predictive value of the equation. The beta weights for recreation, programming, and spreadsheet experience indicate a slight positive relationship between these variables and liking to use computers. Approximately 14% of the variance in the Liking subscale scores was shared by these variables.

Table 8 Regression Coefficients and Beta Weights for Predicting Liking Subscale Score

Dependent Variable	Regression Coeff	Beta
Recreation	.340069	.125169
Programming	.322633	.102068
Spreadsheets	.345886	.094038
(Constant)	28.261938	
Multiple R = .37290		R Square = .13906
F = 20.99736		Significance of F = .0000

Discussion

This study has found that previous computer experiences correlate highly with student attitudes towards using computers. These positive relationships would indicate that these earlier experiences were generally successful ones in which the student felt a sense of accomplishment. However, the vast majority of these experiences were wordprocessing and recreational games.

The weightings of variables were similar for three of the four scales. The Liking subscale differs in that recreational use of computers was the strongest predictor. This finding is consistent with attitude change theory (Martin & Briggs, 1986), which indicates the degree of an individual's attitude committment by studying self-selected behaviors. These types of recreational

experiences are very probably the types of behaviors that strongly indicate a strong positive attitude or liking for computers.

Based upon the researchers' experience working with adults in teacher education programs, the lack of correlation between age and CAS scores was surprising. A further analysis will be conducted which groups ages into ten year ranges (20-29, 30-39, etc.) to see if there is a wide variety of irregular differences between any of these subgroups which, in effect, account for the low correlation.

As teacher educators, the researchers were impressed by the fact that although these participants regarded computers as useful tools in general, few of them thought of the computer as a useful tool for a teacher and they could not think of how they might use a computer in their teaching. This is particularly disturbing because a significant number of the participants are inservice teachers. The researchers expected that anyone with classroom experience would have had opportunities to use, or at least observe, computers in instructional settings and therefore respond negatively to items such as "I can't think of anyway that I will use computers in my career."

Implications of the Study

Student attitudes toward working with computers are important indicators of their future use in instructional settings. This study found a strong relationship between previous computer experience and computer attitudes. While this may not be a cause and effect relationship, it seems apparent that particular types of computer experiences can change attitudes towards computers. Thus, it is important that computing classes be taught in a manner in which the students have many opportunities to work with the computers and that they find these experiences to be successful and interesting.

Further, instructors of computing classes for teacher education students must be careful that their students see a direct connection between what they do in class and what they will be doing in their K-12 classrooms. This can be done by modeling effective instructional strategies, using exercises which exemplify instructional tasks (i.e., using a spreadsheet to calculate student grades, using a wordprocessing package to create lesson plan templates etc.), and frequently relating the class activities to real-world events in instructional settings.

Followup

The Computer Attitude Scale will be administered to the same students again at the end of the semester. These results will be analyzed to determine any changes on the subscale scores and their predictive variables. The researchers

will be particularly interested in knowing if the response patterns change on items related to using computers in K-12 classrooms.

A complementary study is currently underway. This study will involve interviewing randomly selected survey respondents who reported having a relatively high level of anxiety, as measured by scoring in the top 10% of the participants' CAS scores. These interviews will seek to gain a better understanding of their thoughts, expectations, and anxieties about using computers.

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